

## REMARKS

This Amendment responds to the Office Action dated March 24, 2005 in which the Examiner rejected claims 1, 2 and 9 under 35 U.S.C. §102(e), rejected claims 1-6 and 9-13 under 35 U.S.C. §103, objected to claims 7 and 8 as being dependent upon a rejected base claim but allowable if rewritten in independent form and stated that claims 14-16 are allowed over the prior art of record.

As indicated above, claims 1, 3 and 13 have been amended in order to make explicit what is implicit in the claim. The amendment is not necessary to distinguish the claims from the cited prior art, and therefore unrelated to a statutory requirement for patentability.

Claims 1 and 3 claim an optical fiber holding device and claim 13 claims an optical dispersion-equalizer. The devices comprise an optical fiber having a grating, a strip-shaped member and a substrate. Claim 3 additionally claims a heater. Claim 13 claims additionally a heater, a heater control circuit, a peltier element, a temperature sensor, a peltier element control circuit and optical circuitry. The strip-shaped member has a rectilinear groove in which the optical fiber is accommodated. A gap is formed between a wall surface of the rectilinear groove and the optical fiber. A gel substance contacts with the optical fiber and is filled in the gap. The substrate is provided for mounting the strip-shaped member and optical fiber or heater.

Through the structure of the claimed invention having a strip-shaped member having a rectilinear groove in which an optical fiber is accommodated, a gap formed between a wall surface of the rectilinear groove and the optical fiber and a gel substrate contacting the optical fiber and filled in the gap as claimed in claims 1, 3 and 13, the claimed invention provides an optical fiber holding device for optical

dispersion-equalizer which facilitates positioning the grating of the fiber with respect to the heater and prevent polarization mode dispersion characteristics from being degraded. The prior art does not show, teach or suggest the invention as claimed in claims 1, 3 and 13.

Claims 1, 2 and 9 were rejected under 35 U.S.C. §102(e) as being anticipated by *Chamberlain et al.* (U.S. Patent No. 6,411,746).

*Chamberlain et al.* is directed to the control of optical properties of an optical fiber device by thermal manipulation. (col. 1, lines 7-9) A thermally tunable optical device includes an optical fiber device 12. (col. 3, lines 55-65) As depicted in FIG. 1, the tunable optical device 10 includes a heater 14. The heater 14 includes a metal layer 18 and a first electrical contact 20 and a second electrical contact 22 that are spaced apart from one another. The metal layer 18 is a thin metallic film coated onto the surface of an optical fiber device 12. (col. 3, lines 55-65) As shown in FIG. 2, the tunable optical device may be mounted to a substrate 42. The optical fiber device 12 is tensioned and attached to a substrate 42 that has two metallized strips 44 forming an assembly 46. The substrate 42 is a zero-expansion material, typically a ceramic, glass or glass-ceramic. (col. 4, lines 27-32) Tensioning the optical fiber device 12 ensures that when the optical fiber device 12 is a fiber Bragg grating that the grating portion 50 of the optical fiber device 12 remains straight throughout the range of operating temperatures. When the optical fiber device 12 is a fiber Bragg grating and the substrate 42 is an ultra-low expansion material, neither the grating temperature nor the ambient temperature influences the total length of the grating 50. (col. 4, lines 36-43) In an alternate embodiment of the invention, as shown in FIG. 3, the heater 14 includes a metal layer 18 deposited on the sides of a groove 34

in a substrate 32. The substrate may be silica, glass or another material chosen to obtain specified thermal response characteristics. Exemplary of this embodiment is the tunable optical device 10 shown in FIG. 4, this embodiment includes a slotted heater 36 in which the substrate 42 is a capillary tube with an axial bore 62 larger than the diameter of the optical fiber device 12. (col. 4, lines 54-63) In a typical embodiment, the region between the metal layer 18 and the optical fiber device 12 is filled with a hybrid organic/inorganic, glass or glass-ceramic material produced by a sol-gel process. (col. 5, lines 13-20)

The rejection is based on the assertion that the glass or glass-ceramic material produced by sol-gel process, as disclosed in the *Chamberlain et al.* patent, corresponds to the gel substance recited in claim 1. It is respectfully submitted, however, that these materials are not the same. The *Chamberlain et al.* patent does not disclose that a gel substance fills the region between the metal layer 18 and the optical fiber device 12. Rather, it discloses that a sol-gel process is used to make a glass or glass-ceramic material that fills this region. As defined in the McGraw-Hill Dictionary of Scientific and Technical Terms, for example, a sol-gel glass is "an optically transparent amorphous silica or silicate material produced by forming interconnections in a network of colloidal, submicrometer particles under increasing viscosity until the network becomes completely rigid, with about one-half the density of glass." (emphasis added) A copy of the relevant page from the Dictionary is submitted herewith.

Thus, a glass or glass-ceramic material produced by a sol-gel process is a hard material. In contrast, the claim recites a gel substance, which is a soft material. See the specification, for example, at page 13, lines 29-30. As described in the

application, the use of a soft, gel substance around the fiber solves the problem of producing stress in the case where a material holding the optical fiber is hardened. This stress generates birefringence in the fiber, thereby increasing polarization mode dispersion (PMD) when the optical fiber has a grating. The gel substance recited in the claim alleviates this stress, and thereby avoids the negative effects on PMD.

It is respectfully submitted that the glass or glass-ceramic material disclosed in the *Chamberlain et al.* patent is not the same as a gel substance, nor does it accomplish the same results. Accordingly, the *Chamberlain et al.* patent does not anticipate claim 1.

Claims 2 and 9 depend from claim 1 and recite additional features. Applicants respectfully submit that claims 2 and 9 would not have been anticipated by *Chamberlain et al.* within the meaning of 35 U.S.C. §102(e) at least for the reasons set forth above. Therefore, Applicants respectfully request the Examiner to withdraw the rejection of claims 2 and 9 under 35 U.S.C. §102(e).

Claims 1-5 and 9-12 were rejected under 35 U.S.C. §103 as being unpatentable over admitted prior art in view of *Chamberlain et al.*

Referring to FIG. 14, an optical fiber 1 is made of a core and a clad; a grating 2 is formed at a part of the core of the optical fiber and reflects an optical signal of a number of wavelengths; a heater 3 which is made of a thin film for heating the grating to a predetermined temperature distribution; and a substrate 4 which is, for instance, made of quartz and on which the heater 3 is mounted. The grating 2 is used for compensating the wavelength dispersion of a number of optical signals propagated through the optical fiber 1. As shown in FIG. 14, the optical fiber 1 is directly mounted on the heater 3 which is made of the thin film. (page 1, lines 17-28)

Thus, prior art Figure 14 of the specification discloses an optical fiber, a heater and a substrate. Nothing in Applicants' admitted prior art shows, teaches or suggests a strip-shaped member having a rectilinear groove in which an optical fiber is accommodated, a gap formed between a wall surface of the rectilinear groove and the optical fiber and a gel substance contacting with the optical fiber and filled in the gap as claimed in claims 1 and 3.

As discussed above, *Chamberlain et al.* discloses a glass or glass-ceramic material in the region between the metal layer 18 and the optical fiber device 12. The combination of Applicants' admitted prior art and *Chamberlain et al.* might merely suggest to replace the substrate 4 of prior art Figure 14 with the V-shaped grooved substrate 32 shown in Figure 3 of *Chamberlain et al.* and to fill the region between the metal lining 18 of that groove and the fiber 12 with a glass material. Thus nothing in the combination of the references shows, teaches or suggests a strip-shaped member having a rectilinear groove in which an optical fiber is accommodated, a gap formed between a wall surface of the rectilinear groove and the optical fiber and a gel substance contacting with the optical fiber and filled in the gap as claimed in claims 1 and 3. Therefore, Applicants respectfully request that the Examiner withdraw the rejection of claims 1 and 3 under 35 U.S.C. § 103.

Claims 2, 4-5 and 9-12 depend from claims 1 and 3 and recite additional features. Applicants respectfully submit that claims 2, 4-5 and 9-12 would not have been obvious within the meaning of 35 U.S.C. §103 over Applicants' admitted prior art and *Chamberlain et al.* at least for the reasons set forth above. Therefore, Applicants respectfully request that the Examiner withdraw the rejection of claims 2, 4-5 and 9-12 under 35 U.S.C. §103.

Claims 6 and 13 were rejected under 35 U.S.C. §103 as being unpatentable over admitted prior art in view of *Chamberlain et al.* and further in view of *Lauzon et al.* (U.S. Patent No. 5,671,307).

As discussed above, Applicants' admitted prior art and *Chamberlain et al.* do not show, teach or suggest, either singularly or in combination, an optical fiber, a heater, a substrate and a strip-shaped member having a rectilinear groove in which an optical fiber is accommodated, a gap formed between a wall surface of the rectilinear groove and the optical fiber and a gel substance contacting with the optical fiber and filled in the gap as claimed in claim 13. Rather, the combination of *Chamberlain et al.* and the admitted prior art would merely suggest to form the substrate 4 of prior art Fig. 14 with the V-shaped grooved substrate 32 of *Chamberlain et al.*, and to interpose a glass material between the fiber and the substrate. Thus nothing in the references show, teach or suggest a substrate, heater, optical fiber, strip-shaped member and gel substance as claimed in claim 13.

*Lauzon et al.* discloses apparatus and a method for chirping a grating using a temperature gradient. (col. 1, lines 8-9) More particularly, it discloses positioning an optical fiber 1 in a groove 4 of a brass plate 3 which is heated by peltier effect plates 6, 7, 11 and 12. Nothing in *Lauzon et al.* shows, teaches or suggests a strip-shaped member having a rectilinear groove in which optical fiber is accommodated, a gap formed between a wall surface of the rectilinear groove and the optical fiber and a gel substance contacting with the optical fiber and filled in the gap, as claimed in claim 13. Consequently, the proposed combination of Applicants' admitted prior art, *Chamberlain et al.* and *Lauzon et al.* does not teach or suggest the subject matter

claimed in claim 13. Therefore, Applicants respectfully request that the Examiner withdraw the rejection of claim 13 under 35 U.S.C. §103.

Claim 6 depends from claim 3 and recites additional features. Applicants respectfully submit that claim 6 would not have been obvious within the meaning of 35 U.S.C. §103 over Applicants' admitted prior art, *Chamberlain et al.* and *Lauzon et al.* at least for the reasons set forth above. Therefore, Applicants respectfully request that the Examiner withdraw the rejection to claim 6 under 35 U.S.C. §103.

Since objected to claims 7 and 8 depend from allowable claims, Applicants respectfully request that the Examiner withdraw the objection thereto.

The prior art of record, which is not relied upon is acknowledged. The references taken singularly or in combination do not anticipate or make obvious the claimed invention.

Thus it now appears that the application is in condition for reconsideration and allowance. Reconsideration and allowance at an early date are respectfully requested.

If for any reason the Examiner feels that the application is not now in condition for allowance, the Examiner is requested to contact, by telephone, the Applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this case.

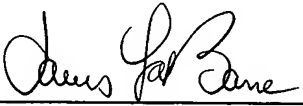
In the event that this paper is not timely filed within the currently set shortened statutory period, Applicants respectfully petition for an appropriate extension of time. The fees for such extension of time may be charged to our Deposit Account No. 02-4800.

In the event that any additional fees are due with this paper, please charge  
our Deposit Account No. 02-4800.

Respectfully submitted,

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Date: June 24, 2005

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